PROC. ENTOMOL. SOC. WASH.
89(2), 1987, pp. 215–218

SECOND EUCINETIDAE-CONIOPHORACEAE ASSOCIATION (COLEOPTERA; BASIDIOMYCETES), WITH NOTES ON THE BIOLOGY OF *EUCINETUS OVIFORMIS* LECONTE (EUCINETIDAE) AND ON TWO SPECIES OF ENDOMYCHIDAE

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Abstract.—A breeding population (adults and larvae) of the eucinetid beetle, *Eucinetus oviformis* LeConte, was found in association with basidiocarps of the wood-rotting fungus *Coniophora arida* (Fr.) Karst. var. *arida* (Basidiomycetes, Coniophoraceae) in the Finger Lakes region of New York in late summer 1986. Larvae of *E. oviformis,* maintained in the laboratory, aggregated upon the substrate and pupated in one closely-packed group. Pupae hung inverted from the last larval exuvia which were attached to the substrate by the caudal end. In addition, adults and larvae of the endomychids, *Mycetina perpulchra* (Newman) and *Aphorista vittata* (F.), also were found in association with the same wood-rotting fungus. The Coniophoraceae-*E. oviformis* association and the two breeding species of Endomychidae on a host in the Coniophoraceae provide additional evidence for the diversity of Coleoptera feeding on minute Basidiomycetes.

Wheeler and Hoebeke (1984) recently reported the discovery of adults, larvae and pupae of *Eucinetus oviformis* LeConte in association with basidiocarps of the wood-rotting fungus *Coniophora olivacea* (Pers.) Karst. near Highlands, North Carolina (Macon County). This represented only the second breeding record for a eucinetid beetle on a Basidiomycete, although fungus-feeding habits have been suggested for more than a century (Perris, 1851). The first substantiated record was for *E. punctulatus* LeConte, which breeds in boletes (Bruns, 1984), although fungus associations were also reported by Klausnitzer (1971, 1975).

In this paper we report the discovery of a breeding population of *E. oviformis* near Trumansburg, New York (Tompkins County) also on a host in the Coniophoraceae, and report the association of the endomychids *Mycetina perpulchra* (Newman) and *Aphorista vittata* (F.) with the same fungus.

Eucinetidae-Coniophoraceae Association

Until our previous report on *E. oviformis* (Wheeler and Hoebeke, 1984), no Eucinetidae were known to feed on wood-rotting Basidiomycetes (Gilbertson, 1984). The collection of another breeding population (including adults and larvae) of this eucinetid beetle on a related species of the same genus of fungus, *Coniophora,* provides further confirmation of this association.

On August 26, 1986, one of us (ERH) found a large fallen trunk of hemlock (*Tsuga canadensis* (L.) Carr.) with a very extensive development of basidiocarps of *Coniophora arida* (Fr.) Karst. var. *arida.* Found on the surface of the fungal fruiting bodies were

adults and larvae of *Eucinetus oviformis*. Mature larvae and some adults were still present as late as October 18, 1986. The collection site was in a large virgin woodlot (known as the Henry A. Smith Woods, founded in 1909), located on the southern village limit of Trumansburg, New York. This woodlot is a small (ca. 30 acres) but impressive stand of old growth forest. The principal soil type is an Arkport fine sandy loam (deep, well-drained and acidic throughout the profile). The forest is dominated by beech (*Fagus grandifolia* Ehr.), sugar maple (*Acer saccharum* Marsh.), tulip tree (*Liriodendron tulipifera* L.), and hemlock (*Tsuga canadensis* (L.) Carr.). The woodland floor is shadowed by an extensive canopy and moisture content is relatively high. These conditions support an understory dominated by elder (*Sambucus*), spikenard (*Aralia racemosa* L.) and numerous herbaceous plants. In addition to the various life stages of the eucinetid, the basidiocarps of *C. arida* were supporting large breeding populations of two species of Endomychidae that are discussed below.

Until its association with *Coniophora olivacea*, the hosts of *Eucinetus oviformis* were unknown. Although other members of the Eucinetidae feed on either fungi or slime molds, there is no clear evidence to suggest that any eucinetids have particularly broad feeding habits. Our two records of *Coniophora* hosts may suggest that *E. oviformis* has a restricted host range—within the Coniophoraceae or related taxa. This hypothesis, of course, remains to be tested with future field work.

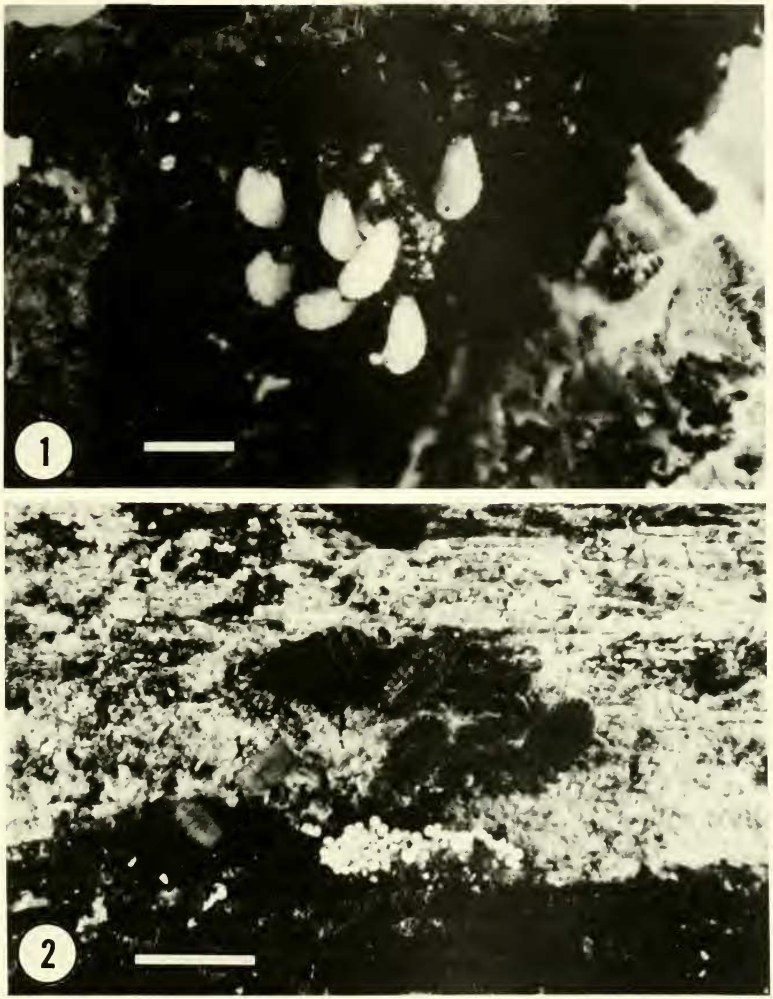
Both species of *Coniophora* reported as hosts for eucinetid beetles have a wide range in North America. *Coniophora arida* var. *arida* is circumglobal in the North and South Temperate zones, and *C. olivacea* is circumglobal in the North Temperate Zone (Ginns, 1982). They occur primarily on dead conifers but may also decay dead hardwoods, particularly those in coniferous forest ecosystems. Their basidiocarps are annual, and in most parts of North America would develop primarily in the summer and early fall and would deteriorate rapidly with the advent of low temperatures. They overwinter as mycelia in the wood. *Coniophora* species cause a brown rot, selectively removing the cellulose and hemicelluloses from wood and leaving a stable residue of slightly modified lignin.

Orientation of Eucinetid pupae

We maintained live *Eucinetus oviformis* larvae in the laboratory, taken from the Trumansburg population. These larvae successfully pupated, and we noticed an interesting phenomenon that has not been previously reported in the Eucinetidae. Larvae pupated in the rearing container gregariously, and pupae hung inverted by an attachment to the last larval exuvium (Fig. 1). The same attachment was apparent, upon reexamination, in the material collected in North Carolina. We are uncertain how widespread this pupation behavior is in other Coleoptera, but have noted a similar case (involving gregarious behavior and inverted hanging in the larval exuvium) in a species of Neotropical *Nilio* (Nilionidae or Tenebrionidae) (Wheeler, unpublished data).

Endomychidae Associated with Coniophoraceae

Relatively few specific fungal associations are recorded for species of Endomychidae; those that are recorded include various Basidiomycetes (Scheerpeltz and Höfler, 1948; Benick, 1952). The lack of much specific host data suggested to Crowson (1984) that many endomychids might be associated with Ascomycetes. Our observations on two genera (below), however, add another possible explanation for the lack of published host records. At the Trumansburg collecting site and intermingled with the eucinetids, breeding populations of two species of Endomychidae were also found on the same host, *Coniophora arida*. On August 26, 1986, numerous larvae of *My-*



Figs. 1, 2. 1, Aggregation of pupae of *Eucinetus oviformis* LeConte; pupae hang inverted from the last larval exuvia which are attached by the caudal ends to the substrate. Scale line = 4 mm. 2, Mature larvae of *Aphorista vittata* (F.) (4 large, dark larvae) and *Mycetina perpulchra* (Newman) (2 small, pale larvae) grazing on basidiocarps of the wood-rotting fungus *Coniophora arida* var. *arida*. Scale line = 1 cm.

cetina perpulchra (Newman) and *Aphorista vittata* (F.) were found moving over basidiocarps of the wood-rotting fungus (Fig. 2). Adult pairs of both species were found *in copula* upon the felled hemlock trunk. Larval identification was made by association with adults. Considerably more larvae and adults of *M. perpulchra* than *A. vittata* were present on this first collecting date. On later visits to the same site (September 27 and October 18, 1986), ERH found larvae of *A. vittata* in much greater abundance. Also on October 18, adults of *M. perpulchra* were again extremely numerous. So far as we know, this is the first published record of Endomychidae on a host in the Coniophoraceae. Voucher specimens of larvae and adults of both endomychids are in the Cornell University Insect Collection along with samples of the wood-rotting fungus.

Conclusions

Many wood-rotting Basidiomycetes never produce large fruiting bodies (Gilbertson, 1984) and yet occur with such abundance and frequency that they must pose a sizable resource for mycophagous insects. This confirmation of the Coniophoraceae-Eucinetidae association and the new breeding reports of two species of Endomychidae on a host in the Coniophoraceae provide added evidence for the diversity of Coleoptera feeding on minute Basidiomycetes, a fauna that also includes Dasyceridae (Wheeler, 1984). Similar field studies are needed to further elucidate relationships between beetles and these wood-rotting fungi.

Acknowledgments

This research was supported, in part, by NSF Grant No. BSR-8315457 and Hatch Project no. NY(C)139426 to Q. D. Wheeler. We thank Peter Marks (Cornell University) for providing us with information about the abiotic and biotic communities of the Henry Smith Woods.

Literature Cited

Benick, L. 1952. Pilzkäfer und Käferpilze. Acta Zool. Fennica, no. 70, 250 pp.

Bruns, T. D. 1984. Insect mycophagy in the Boletales: Fungivore diversity and the mushroom habitat, pp. 91–129. *In* Wheeler, Q. and M. Blackwell, eds., Fungus-Insect Relationships. Columbia University Press, New York.

Crowson, R. A. 1984. The associations of Coleoptera with Ascomycetes, pp. 256–285. *In* Wheeler, Q. and M. Blackwell, eds. Fungus-Insect Relationships. Columbia University Press, New York.

Gilbertson, R. L. 1984. Relationships between insects and wood-rotting Basidiomycetes, pp. 130–165. *In* Wheeler, Q. and M. Blackwell, eds., Fungus-Insect Relationships. Columbia University Press, New York.

Ginns, J. 1982. A monograph of the genus *Coniophora* (Aphyllophorales, Basidiomycetes). Opera Bot. 61: 1–61.

Klausnitzer, B. 1971. Zur Biologie einheimischer Kaferfamilien, 7. Eucinetidae. Entomol. Ber. 15: 73–74.

———. 1975. Beitrage zur Insektenfauna der DDR: Coleoptera-Eucinetidae. Beitr. Entomol., Berl. 25(2): 325–327.

Perris, E. 1851. Quelques mots de les metamorphoses de Coleopteres mycetophages, le *Triphyllus punctatus,* Fab.; le *Diphyllus lunatus,* Fab.; l'*Agathidium seminulum,* Linn., et l'*Eucinetus* (*Nycteus* Latr.) *meridionalis* de Castelnau. Ann. Soc. Entomol. France (2)9: 39–53.

Scheerpeltz, O. and K. Höfler. 1948. Kafer und Pilze. Verlag fur Jugend und Volk, Wien. 351 pp. + IX plates.

Wheeler, Q. D. 1984. Notes on host associations and habitats of Dasyceridae (Coleoptera) in the southern Appalachian Mountains. Coleopt. Bull. 38: 227–231.

Wheeler, Q. D. and E. R. Hoebeke. 1984. A review of mycophagy in the Eucinetoidea (Coleoptera), with notes on an association of the eucinetid beetle, *Eucinetus oviformis,* with a Coniophoraceae fungus (Basidiomycetes: Aphyllophorales). Proc. Entomol. Soc. Wash. 86: 274–277.